



WENTWORTH
INSTITUTE OF TECHNOLOGY

**Final Paper: Launch Control Network Engineer Spring
Internship 2017**

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Major: Interdisciplinary Engineering (Computer Engineering)
Spaceport Command and Control Systems (SCCS) Network

Date: 04/17/2017

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Nomenclature

KSC	= Kennedy Space Center
SCCS	= The Spaceport Command and Control System
LCS	= Launch Control System
SLS	= Space Launch System
ICPS	= Interim Cryogenic Propulsion Stage
MPCV	= Orion Multipurpose Crew Vehicle
CAIDA	= Customer Avionics Interface Development and Analysis
LCC	= Launch Control Room
FR1/2/3	= Firing Room 1, 2, 3
DA	= Development Activities
WO	= Work Order
DVT	= Design Verification Test
CLI	= Command Line Interface

I. Introduction

The Spaceport Command and Control System (SCCS) is being built at the Kennedy Space Center in order to successfully launch NASA's revolutionary vehicle that allows humans to explore further into space than ever before. During my internship, I worked with the Network, Firewall, and Hardware teams that are all contributing to the huge SCCS network project effort. I learned the SCCS network design and the several concepts that are running in the background. I also updated and designed documentation for physical networks that are part of SCCS. This includes being able to assist and build physical installations as well as configurations. I worked with the network design for vehicle telemetry interfaces to the Launch Control System (LCS); this allows the interface to interact with other systems at other NASA locations. This network design includes the Space Launch System (SLS), Interim Cryogenic Propulsion Stage (ICPS), and the Orion Multipurpose Crew Vehicle (MPCV). I worked on the network design and implementation in the Customer Avionics Interface Development and Analysis (CAIDA) lab.

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II. Technical Approach

Being a part of the Hardware team, I learned how to use NASA's document repository and NASA's work management system. I attended a training session to be efficient and knowledgeable in this new software. The document repository is where all of the engineering drawings are stored for reference, revision and updating. I used this system to find network/server rack assembly, cable running lists, running wire schematics, and network/server set installations. Using these documents, I had to redline certain drawings with recent changes and physical installations in the Firing Rooms, and give them to my fellow hardware team members to go through the review and finalization process. The final version is then put into the official system. I used the management system to check the status and assignments of work orders. There were also times when an assignment was completed and I had to close the DA to show the work was finished.

III. Tasks

A. Learning the basics

Over the course of the internship, I worked alongside the Hardware team and my mentor, Kelvin Ruiz. The first task that was given to me was completing the Juniper Networking WBT online course to gain a better understanding of the basics of computer networking. The training gave me the knowledge I needed to grasp how these systems work together to one day send humans into deep space exploration.

B. Introduction to Firing Rooms



After the training, I was able to experience how the Firing Rooms are set up and how the physical hardware is connected to be compatible with different systems. My first assignment consisted of installing power supply cables that would support the servers inside the rack. This is also when I was introduced to the labeling system for all connections whether they were external or internal to the rack(s). I learned the importance of labeling and found it incredibly useful to have a detailed log of notes of day-to-day assignments.

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C. Research of equipment

I conducted hours of research to understand how switches and other equipment work within a controlled system. I was assigned to produce a Distribution Switch DVT with step-by-step instructions for each requirement. I created my own organized document that had the requirement description, expected results, actual results and necessary procedures to prove that this piece of hardware has certain characteristics and functions. I referred to the switches configuration reference manual where I learned to use the CLI to either demonstrate, inspect, or analyze a specific hardware requirement. In addition to the switch, I also researched how management modules and telemetry equipment work and how to configure them. Additionally, I assisted with another DVT, but in this case for a firewall.

D. Updating network drawings and running cables

For most of my assignments, I used NASA's document repository to find internal/external cable running lists, wire schematics and rack assemblies. These specific documents needed to be reviewed and updated to what was previously installed in each rack. I had to find hardware part numbers, assign and label cable numbers. I was also tasked with running cables under the floor boards of each Firing Room where the cables are installed at each end. The Hardware Team had multiple projects that needed to be completed, so it took time management and organized notes to make each deadline during my internship.

E. Visuals

I also worked with Microsoft Visio, where I explored and created graphic visuals for new and upcoming LCS hardware design concepts. The drawing allowed the Hardware Team and other teams we worked with to visually see the bigger picture of our large long-term project.

F. Consolidation of network connections

The focus on my long-term project was to consolidate networking hardware for the CAIDA team. This is where all of what I learned so far in the internship came together to see how each different piece works together for one goal. This included updating rack drawings, running cables and labeling.

IV. Conclusion

Overall, this internship has given me an incredible amount of knowledge about computer networking systems. I learned how to physically install different types of equipment and cables as well as update rack drawings. I have learned that engineering design details are extremely important which made my notes very descriptive and technical. I have experienced multiple phases of the engineering design process from concept on paper to running cables under the floor boards of the Firing Rooms.

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V. Acknowledgements

I would like to thank the Hardware team who worked with me and guided me to gain a better understanding of how computer networking is such an important part of NASA's space exploration programs. They provided me with support when I needed it whether it was about physically installing hardware, rack drawings or how to navigate NASA's resources. I also want to thank Ms. Caylyene Shelton and Ms. Jamie Szafran for making the transition into this experience welcoming and enjoyable. The weekly intern meetings gave me insight to how many incredible projects NASA has in store for the future. Finally, I also would like to thank my mentor, Kelvin Ruiz, for helping me throughout my first internship experience. From having little background in computer networking, he was able to guide me through the concepts and equipment involved in his current projects. Now, I am well accustomed to the world of computer networking and as a result I can use my new skills in future engineering design projects.

VI. References

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